Mecheleciv

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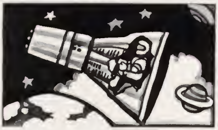
THE GEORGE WASHINGTON UNIVERSITY

MAY 1966

Here are 7 knotty problems facing the Air Force: can you help us solve one?

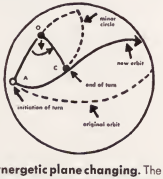


1. Repairs in space. If something goes wrong with a vehicle in orbit, how can it be fixed? Answers must be found, if large-scale space operations are to become a reality. For this and other assignments Air Force scientists and engineers will be called on to answer in the next few years, we need the best brains available.

2. Lunar landing. The exact composition of the lunar surface, as well as structural and propulsion characteristics of the space vehicle, enter into this problem. Important study remains to be done—and, as an Air Force officer, you could be the one to do it!

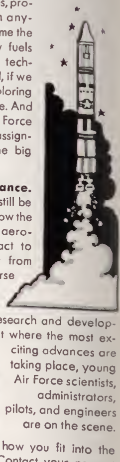
3. Life-support biology. The filling of metabolic needs over very extended periods of time in space is one of the most fascinating subjects that Air Force scientists are investigating. The results promise to have vital ramifications for our life on earth, as well as in outer space.

4. Space orientation. The orbital problems of a spacecraft, including its ability to maneuver over selected points on the earth, are of vital importance to the military utilization of space. There are plenty of assignments for young Air Force physicists in this area.

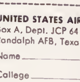


5. Synergetic plane changing. The ability of a spacecraft to change altitude can also be crucial to space operations. Where but in the Air Force could Sc.B.'s get the chance to work on such fascinating projects right at the start of their careers?

6. Space propulsion. As our space flights cover greater and greater distances, propulsion—more than anything else—will become the limiting factor. New fuels and new propulsion techniques must be found, if we are to keep on exploring the mysteries of space. And it may well be an Air Force scientist on his first assignment who makes the big breakthrough!



7. Pilot performance. Important tests must still be made to determine how the pilots of manned aerospacecraft will react to long periods away from the earth. Of course not every new Air Force officer becomes involved in research and development right away. But where the most exciting advances are taking place, young Air Force scientists, administrators, pilots, and engineers are on the scene.



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BE PART OF IT—
AMERICA'S AEROSPACE TEAM

STUDENT PROFESSIONAL SOCIETIES: AIMS AND CONDUCT

Some comments follow concerning the vast difference between theory and practice in the aims and conduct of the student professional societies. No gratuitous insults are intended to the leadership of these groups, some of whom are doing an unusually energetic job. The unfortunate thing is that some of these individuals are headed in the wrong direction. Offered here is some constructive criticism which will help them next fall.

In the first place, the aim should be to give, not to get. Well-intentioned membership committees are urging those to join who cannot possibly attend meetings, because of classes or other more personal reasons. The aim has been to get as large a nominal membership as possible, and to get added revenue. Persons who next year might be enthusiastic members are thus given an unfortunate first impression of the group. Accept as members only those who can participate fully.

There can be no reason, except indolence, for the failure of the societies to present a well mapped out program at the time memberships are solicited in the fall. Of course, not all the speakers could be listed, but field trips and other special events could, and at least the first meetings schedule should be known.

Meetings should be conducted in a brisk and business-like manner. Here the chairman must do a little advance thinking and planning. The dreary, aimless meanderings of the usual society business meetings are enough to deaded the resolve and enthusiasm of even the most hardy. If necessary, get a stooge to throw a couple of unpopular but worthy motions (like mandatory attendance) on the floor and railroad them through. If this does not arouse at least angered participation from your members (especially absentees) they are dead indeed. The least the chairman can do is to have a definite agenda, and to get through it quickly and efficiently.

Offer the members a real opportunity to develop their professional sense of public responsibility. The failure to do this is the most serious shortcoming possible.

Choose as subjects for most of the meetings topics of national or great local interest on which the professional man should have opinions. For example, water and air pollution, or automobile safety, or automation and unemployment. Stop talking about hyperbolically wound phase degenerators and discuss the engineer's role in administrative government.

The societies can become live, progressive organizations by the expenditure of a little more effort directed along these lines.

The Mechelecív

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page

ARTICLES

DEPARTMENTS

COVER

When a computer breaks down, how is the malfunction located. The gentleman on this month's cover is doing it the hard way. To find out how it should be done, read the article on computer diagnostics on page 8.

FRONTISPIECE

Depicted are rectifiers which will tolerate conditions of high radiation.

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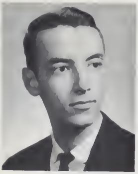


UNIVERSITY REPORT

by Paul Johnson

Paul Johnson is a junior majoring in electrical engineering and holds a Trustees' scholarship. He received the Sigma Tau Award for the Outstanding Freshman in the Engineering School for 1963-64, and is a member of Tau Beta Pi and IEEE. He has served as Chief Engineer of campus radio station WRGW and was elected to the Student Council in a close three-way race in February.

VICE-PRESIDENT BROWN

The month of April brought to GW a piece of news which will mean a great loss to the University. John Anthony Brown, vice-president and dean of faculties, announced on April 14 that he would resign in June to become president of Lindenwood College, St. Charles, Mo.

Faculty members and students alike have come to recognize the unique contributions which Vice-President Brown has made to GW. He came here in 1963 as assistant vice-president for plans and resources. In July, 1964, he became vice-president for plans and resources. As his first task in that office, he drafted a document which laid down a long-range academic plan for the University. This plan was endorsed enthusiastically by the Faculty Senate and University deans, and has been accepted by a Board of Trustees committee as the University's basic academic guideline.

Vice-President Brown consistently refused to accept things as they were and said so when he felt changes were required. He always recognized the importance of the place of students, even when it seemed that he was the only member of the administration who did. He made a special point of maintaining close contact with the student body. It is little wonder that such an extraordinary man is looked upon as a friend by members of the University community. We are sorry to see him go, but we know that the students at Lindenwood will be impressed with their new president.

CAMPUS COFFEE-HOUSE

In other campus news, April also saw the opening of the Agora coffee-house. Agora is a Greek word meaning "market place," which, of course, has always been a place for stimulating discussion. The GW Agora apparently had its share of that during its first week of operation, with 200 to 300 students in attendance each evening.

The coffee-house is to be found in the Faculty Club, the first floor of which is transformed into the Agora each night except Saturday. The hours are 8 to 12 each night except Friday, when closing time is one a.m. The menu includes eight different kinds of coffee, four kinds of tea, and four types of pastries.

This writer went to the Agora twice during its first week and was quite impressed. Probably the most remarkable thing about it is the cooperation and lack of red tape with which it came into being. The offices of the deans of men and women, the art department, the business office, the recreation department, and Slater's all have contributed to the establishment of the Agora. Particular credit must go to students Bonnie Bing and Dave Williams, who have directed operations thus far. The Agora can be a great and worthwhile addition to the GW campus, if students continue their support.

STUDENT COUNCIL

In Student Council news, President Rick Harrison addressed the Faculty Senate on April 1, emphasizing continued improvement of student-faculty relations. One specific request was for student observers to be allowed at Senate meetings. He also asked that the Senate's Committee on Student Affairs and the Student Council's Faculty Liaison Committee be combined into one group, in which student members could vote. Other requests made by Harrison were for a policy of unlimited cuts and for an honors program which would allow qualified students to take non-graded (pass or fail) credit courses in special fields.

After Harrison's speech, the Senate referred his proposals to appropriate committees. It is to be hoped that these committees will work as quickly as possible and take positive steps in these areas.

The main Council action taken last month was the defeat of a proposal for a voting foreign student representative. The general feeling of those opposed to the motion was that a separate voting representative for the foreign students would only segregate them from the rest of the student body. It was felt that the proponents of the idea had not demonstrated genuine additional benefits to the foreign students, who presently vote for as many representatives as do all other students.

In other actions, the Student Council initiated scholastic and athletic awards for graduating seniors. The scholastic award will go to the senior whose QPI is highest above the average for his school. The athletic award, to be based not only on athletics, but on academic standing and extra-curricular activities as well, will go to that person selected by a committee of representatives from the student body, administration, and athletic department.

The Council has also voted to sponsor an annual student congress at GW, beginning next spring. Students from universities in all parts of the country would be invited to participate in this sort of mock legislature, taking advantage of GW's Washington location.

FACULTY SPOTLIGHT

by Tim Stegmaier

DR. WILLIAM J. YOUDEN

Born in Australia at the turn of the century, Professor William J. Youden was destined to pursue an extremely interesting career which eventually led him to accept his present position at The Measurement Center here. Professor Youden left Australia in 1902, spent his early childhood in England, and came to America in 1907. He served in the Army in 1918 and then began his pursuit of a professional education.

In 1921, John Youden received the degree of B.S. in Chemical Engineering from the University of Rochester. He then received the M.A. degree in Chemistry from Columbia University in 1923 and the Ph.D. in 1924 also from Columbia. He then chose a position as a chemist with the Boyce Thompson Institute for Plant Research, an association which he maintained until 1948. In the 1930's he developed an interest in statistical analysis which resulted in the awarding of a Rockefeller Fellowship at the University College in London in 1937-38.

However in 1942 the Second World War intervened and he spent four years overseas with the Army Air Force doing statistical analysis on bombing accuracy. For this service he received the Medal of Freedom in 1946 which was awarded to those who had contributed significantly to the defense effort.

In 1947 he was associated with the Rand Corporation and he was a consultant with Douglas Aircraft Company. Since that time he has served in several capacities at several universities in this country. He was a lecturer on Design of Experiments at Columbia University in 1952 and a visiting professor at North Carolina State College and the University of Chicago. He was a statistical consultant at the National Bureau of Standards from 1948 to 1965 at which time he accepted his present position. His major interest has been in the area of the design and interpretation of experiments.

The professor's writing has included over one hundred publications including two books titled Statistical Methods for Chemists and Experimentation and Measurement and a regular column Statistical Design published in "Industrial and Engineering Chemistry" from 1954 to 1959. He conservatively estimates that he has delivered 500 lectures again dealing primarily with his favorite interest, the application of statistics.

He was sponsored by The American Chemical Society for eight speaking tours and by The Canadian Institute for Chemistry for one. In 1962 he toured Australia under the auspices of The Commonwealth Scientific and Industrial Research Organization and he expects to return for another tour sometime in the future.

Of personal interest, Professor Youden enjoys printing as a hobby, and he has three grown children. He is a member of Sigma Xi, Phi Beta Kappa, The American Chemical Society and many other professional and honor societies. He is a well-respected and well-liked man and an asset to our university and community.

COMPUTER DIAGNOSTI

Mr. Thurston is one of the founders of ARIES Corporation, and is presently Program Manager for ARIES' Minneapolis office. Previously he was a section head for Univac Division of Sperry Rand Corporation, where his responsibilities involved compiler production and the development of software techniques. He holds a B.S. in Statistics from the University of Minnesota.

INTRODUCTION

Diagnostics play a very important part in a computer system. The time element required to detect and isolate a failure is very critical. It can be an expensive operation to have an entire computer system down for several hours or even days just because one diode is open. Likewise, some system operating requirements permit "down" time of only minutes for the entire system. Therefore, an efficient means of diagnosing and detecting a failure is very important.

THE HISTORY OF DIAGNOSTICS

The history of diagnostics dates back to the beginning of the computer era. Even though a computer has been termed an electronic brain, it still encounters periodic unscheduled malfunctions. One of the earliest methods utilized to detect and isolate failures involved exercising certain actions from the computer console and executing a diagnostic program located in the computer memory. By performing these functions, it was possible to isolate failures to a particular portion of the computer and by further use of rather elaborate testing equipment it was possible to eventually find the failure. One of the biggest problems encountered in using this approach was the time lapse that is sometimes required to find a component failure. This could vary anywhere from one hour to possibly one week. This time lapse is completely unacceptable today.

Another technique utilized is termed the "Armstrong" method. This approach requires the use of a computer, normally working, to create a failure manual which contains an index of the symptoms of a particular component failure. Diagnostic procedures can be performed from the computer maintenance console and, like the preceding method, a diagnostic program is executed in the computer memory. As each procedure is performed, a certain component in the normal computer is "bugged" to simulate the effect of a diode or transistor being open or shorted. If the indications on the maintenance panel are different than what they normally should be, the values of the registers are recorded in a failure manual along with the corresponding failing component or card location. In actually performing these same functions on a failing computer, the indication is checked at the end of each procedure to determine if they are different from the normal results. If this is the case, a "lookup" is made in the failure manual to determine which card or component has failed. If no error is detected, the operator proceeds to the next step in the diagnostic procedures. One of the biggest drawbacks in the "Armstrong" method is the amount of computer time required on the "failure-free" computer to perform this simulation process. Also, it is a very tedious job for the person attempting to perform these tasks.

THE SIMULATION APPROACH

A third approach to diagnostics involves simulating one computer on another, inducing failures, and automatically creating a failure manual to reflect these probable failure indications. By utilizing certain techniques, this approach seems to be the most favorable and will be discussed at length throughout the remainder of this article.

Extensive research has been done in the area of diagnostics over the past three years. Much analysis has gone into the various approaches aforementioned and it is the opinion of ARIES' professional staff that some form of simulation, depending on the type and size of computer to be simulated, is the ultimate solution to the production of good diagnostics. For a small percentage of the components in a computer, however, manual bugging of the machine might be the only solution.

The basic philosophy of the simulation concept is that the failure indications are predetermined by simulating the logic circuits of one computer on another using certain diagnostic procedures. When it has been determined that a computer is not operating properly, these same diagnostics are then exercised on this computer, specific indications are observed on the computer maintenance panel and a lookup is made in the failure manual to determine which component is failing.

There are two goals which must be attained in order to provide an efficient means of detecting and isolating failures. Simulation time on

NEW ERA

by Robert W. Thurston

and

Milan L. Eaton

Mr. Elton has been project manager in the area of diagnostics research and development for the past two years with ARIES Corporation, Minneapolis, Minnesota. Prior to this, he was a programmer in software development with the UNIVAC Division of the Sperry Rand Corporation in St. Paul, Minnesota. He holds a BA in mathematics and business administration from Concordia College, Moorhead, Minnesota and a Certificate in Data Processing from the Data Processing Management Association.

the computer doing the simulation and the computer time on the failing computer required to detect and isolate a failure by the user should both be kept at a minimum. By using various programming techniques these two factors are optimized to achieve the most efficient result.

SIMULATION PROGRAMMING

The input to the main simulation program is the description of the logic circuitry of the computer to be simulated. Nearly all of the circuits in a computer can be described in terms of Boolean algebra functions. Voltage can be expressed as high or low, switches are either on or off, or a bit is either set or not set. In terms of simulation, these conditions can be expressed using the numerics 0 to 1. Therefore, each circuit in the computer can be described in an equation file that is used to generate instructions used to simulate each circuit. Each generated instruction is analogous to a component in the circuit and by utilizing and/or type instructions, the structure of a circuit can be created. An executive routine is required to control the execution of these instructions, to maintain a linkage between the logic circuits and all non-logic elements, and also to induce a failure into the generated instructions. An assumption should be made at this time that only open diodes and open or shorted transistors are analyzed. By changing a generated instruction to an opposite state of the condition being tested, a failure may be induced and by executing the generated instructions under this mode, a failure indication may be created during the simulation of a diagnostic procedure. An editing and print routine will then printout the failures in a manual. The basic time element utilized for the execution of the generated instruction can be either a clock phase or card switching time. If the length of wires is not a consideration for simulation, clock phase need be the smallest time element. However, while exercising the instructions using this time element, this instruction must be executed in a loop condition a number of iterations equal to the number of cards that may be switched during one clock phase.

EFFICIENCY ROUTINES

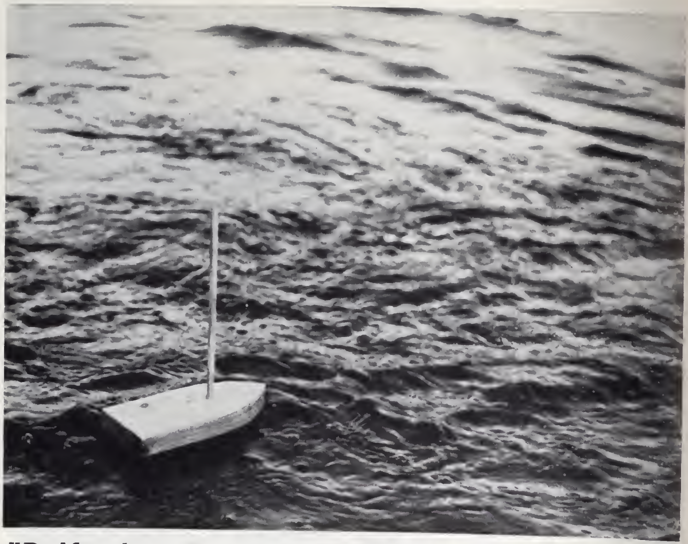
Non-logic elements such as core and input-output logic require handwritten routines since no direct Boolean function can be performed to describe the operation. Delay circuits are another example of this and together with core and I/O must be controlled by the executive routine to provide linkage to the logical elements.

For large computers, efficiency routines must be written in order to reduce the computer simulation time. These routines are written to do such things as moving data between registers provided no failures are induced in that area and to determine what areas of a computer are not utilized at particular times. A routine must also be programmed to determine in what section of the diagnostic procedure an induced failure could possibly be propagated to a failure indication.

The greatest amount of human effort and computer time used with these techniques is writing and exercising the simulator. Once the failure manual has been created, the user can then apply these same diagnostic procedures on the failing computer. When a failure appears as an indication, a lookup can then be made in the manual to determine which component, circuit, or card is failing. The simulation is, of course, a "one-shot" process. Therefore, once the failure manual is created, the time element required to detect and isolate a solid single failure should be minimal. One further factor to consider is the number of console actions the user has to perform before the actual diagnostic program can be loaded. The fewer the actions required, the less time will be required to find the failure.

Another technique that can be used to reduce programming time in writing a simulator is to create a simulator generator for a family of computers. A minimal of restrictions have to be placed on a system such as this. The basic input of equations describing the logic elements have to be in a standard format. Also special routines have to be written to describe all non-logic elements. However, a considerable amount of human effort is saved using this technique.

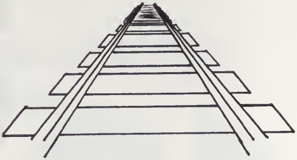
The preceding paragraphs have briefly described some techniques derived from extensive research in diagnostics for solid, single failures using the simulation approach. Further research has been done and is continuing on other diagnostic techniques in the areas of intermittent and multiple failures, engineering changes, shorted diodes and, also, diagnostics for peripherals.



TWIN RAILS TO OPPORTUNITY

by William Everard

William H. Everard is graduating this Spring with a B.S.E.E. A transfer student from Bucknell University in Lewisburg, Pa., Bill will be going to work for the Pennsylvania Railroad as a junior engineer in communications and signals.



RR'S: A PROMISING DOOR

Billowing smoke, laboring breath, a sharp clickety-clack of rail joints, and the now short, now long moan of the steam whistle, all sounds to thrill the heart of any small boy. Wherever a railroad exists and boys have been able to hear its sounds and wave to the passing engineer, there has been the dream of being a railroad man. Now, in the space age, we discount this dream; a decision which, for the engineering college graduate, may be the slamming of a very promising occupational door.

Railroads began in the early 19th Century with the coupling of Watt's marvelous steam engine to a set of driving wheels. In their first hundred years railroads challenged the spirit and imagination of civil, mechanical, and finally electrical engineers with problems of motive power, right-of-way, and signals. Many of the bridge structures in use today were direct results of railroad designs, and rolling stock and locomotives became a proving ground for bearings, suspension systems, energy conversion ideas, and control systems. Today, the railroads are rapidly losing their traditionalist opposition to reform and are providing a vocational climate quite receptive to new concepts in transportation, engineering, and management.

WHY, WHAT, AND WHERE

To better understand the opportunities offered we need to know what a railroad is, why it exists, and where it exists. First, a railroad is a company chartered by a governing legislative body for the purpose of constructing, maintaining, and operating a common carrier consisting of vehicles with flanged wheels moving over a pair of steel rails. Secondly, the why of its existence is summed up in the phrase "common carrier"; that is, its purpose is to provide transportation for materials, livestock and people for the common use of anyone who desires transit at the current rate. As to location, railroads service almost every major town and city in the United States as well as special areas such as the iron mines. In some areas lines have been abandoned but this is mostly due to the previous demise of the industry or resource that required a railroad there in the first place.

MISCONCEPTIONS

Now, you ask, what does this have to do with me as an engineer? After all, all the railroads are already built and that type of transportation is on the decline these days. Both ideas are typical misconceptions caused by rumors and loud talk of the ignorant. In the first place, railroads, just like highways and airdromes, are never through with construction and maintenance. Whether you are a civil engineer laying track or designing bridges, a mechanical engineer redesigning rolling stock or motive power, an electrical or communications engineer maintaining signal circuits or researching new control techniques, or even a mining engineer developing new ways of tapping coal resources for industry, there is always a new and challenging job to be found with the railroads. It has been estimated that the railroads are the only form of commodity transportation in this country which is not operating at near maximum; instead, it is somewhere near 50%. This in itself serves to show that if our nation is to increase both its own economic development and continue to fight a cold (or hot) war, use of this mode of transportation must be increased. When this increase occurs there will be even more opportunities for engineers.

RR MANAGEMENT

Finally, the engineer should give serious consideration to the rising opportunity of management. Railroads, as many other industries, have found that the analytical approach inherent in the engineer's training is invaluable in assessing and rendering the command decisions of management. When we contemplate the tremendous business propositions of such railroad mergers as the proposed Pennsylvania -- New York Central or the Norfolk and Western -- Chesapeake and Ohio -- Baltimore and Ohio, it becomes obvious that the management of such organizations must be in a position to fathom and analyze the continuous technological changes of the space age as well as be able to render sound business decisions based purely on their judgement of the critical facts available. The door is open and waiting to be explored and for the dreamer with the will to work there is still a chance to be president, not of something so common as the United States, but of that fascinating thing called a railroad.

LATE NEWS for 1966 ENGINEERING GRADUATES

MECH MISS . . .

MISS TINA GORHAM

Miss May comes to us straight from the Agora, where she sings and plays the guitar.

Tina is a pretty, honey blonde freshman majoring in interior design. A Silver Spring, Maryland, girl now, she has spent six of her 18 years living in Tokyo, Japan.

Music is her favorite pastime. After eleven years of formal study on the piano, she taught herself to play the guitar. And with that instrument, Tina enjoys being a performer, as well as a follower, of contemporary folk music.

When this figure was scanned by one of the abler computers on campus, the following binary output was observed:

100100
011010
100101

CAMPUS NEWS

TAU BETA PI INITIATION

by Paul Johnson

The District of Columbia Gamma Chapter of Tau Beta Pi, national engineering honorary society, initiated seven students and two faculty members at a ceremony held on Sunday, April 24. Those initiated were Barrington Cox, Earl Flowers, Sterling R. Maddox, Thomas McSpadden, Perry Saidman, Orville Standifer, John Starke, and Professors A. C. Meltzer and T. G. Toridis. Also elected to membership, but not present at the ceremony, was James M. Diehl.

National requirements of Tau Beta Pi specify that, to be eligible for membership, undergraduates must be in the top eighth of their class during their junior year, or in the top fifth during their senior year. The D. C. Gamma Chapter, established at GW in February, 1963, has instituted, in addition, a minimum QPI requirement of 3.50 for first-semester juniors, and 3.00 for those beyond that level.

Barrington Cox is a senior majoring in mechanical engineering. He has a QPI of 3.04 and holds Henry H. Carter and Frederick and Alma Hand Britten engineering scholarships. He is a member of Sigma Tau, secretary of ASME, and a member of Phi Sigma Kappa social fraternity.

James M. Diehl, a senior majoring in electrical has a 3.03 QPI. He is president of Phi Sigma Kappa, a former member of the Engineers' Council, and a member of Sigma Tau and Gate and Key fraternity honorary. Upon graduation, he will receive a commission in the U. S. Navy and will do graduate work in electrical engineering.

Earl C. Flowers, a senior studying electronics, has a QPI of 3.40. He is a member of IEEE and works full-time at the National Security Agency. He received the Sigma Tau Award for the outstanding freshman in the Engineering School in 1958-59.

Sterling Maddox is a senior in civil engineering with a 3.29 average. He presently does work as a land surveyor, and after graduation plans to be a civil engineer for the Navy's Bureau of Yards and Docks.

Thomas E. McSpadden is a junior majoring in mechanical engineering and has a 3.15 QPI. As his father is a Spanish professor at GW, he holds a tenure faculty member scholarship. He is a member of ASME and Sigma Tau.

Perry Saidman is a junior with a QPI of 3.09, majoring in electrical engineering. He holds a Trustees' scholarship and supervises the Engineering School library. He has been elected to the Engineers' Council three times and is a member of IEEE. He is also a member of Sigma Tau and Alpha Epsilon Pi social fraternity.

Orville Standifer is a senior studying electrical engineering. He maintains a QPI of 3.39 while working 24 hours per week for the Potomac Electric Power Company. He also holds a full scholarship from the Weyerhaeuser Company Foundation. He is a past secretary of the Engineers' Council and a member of IEEE and Sigma Tau.

John Starke is a senior majoring in electrical engineering. He has a 3.02 QPI and holds a Trustees' scholarship. He has been a member of the Engineers' Council for four years, and vice-president for the year 1965-66. He is a member of Sigma Tau and Sigma Nu social fraternity.

Both faculty members initiated, Arnold C. Meltzer and Theodore G. Toridis, are assistant professors in the Engineering School. Professor Meltzer received both his BS and MS at GW with a specialization in machine computers, and is currently enrolled in the Doctor of Science program. He has worked as an electrical engineer and has acted as a consultant for the Federal Power Commission. On leave of absence until August as a Science Faculty Fellow of the National Science Foundation, he has passed his doctoral comprehensives and hopes to complete his dissertation this summer.

Professor Toridis received his BS from Robert College, Istanbul, Turkey, and obtained his MS and Ph.D. degrees at Michigan State University, all with majors in civil engineering. He has worked as a design engineer and has served in the Army Corps of Engineers. He has been teaching at GW since 1964 and has written several technical papers which have been published.

After the initiation ceremony, the following officers were elected for the 1966-67 year: Paul Johnson, president; Perry Saidman, vice-president; Thomas McSpadden, treasurer; Khollilah Khozeimeh, recording secretary; Dillon Scofield, corresponding secretary; and Morton Taragin, cataloguer.

THETA TAU'S BANQUET AND BALL

by Doug Lowe

Once a semester (at least) comes the day to throw down the books, pick up the girls, and have a plain, old good time. Theta Tau's recent Banquet and Ball was just such a time.

It was the finale to the initiation of the nine members of the spring pledge class. During the preceding weeks, these men learned about the fraternity and performed the miscellaneous duties assigned to all pledges. The occasion of the Ball was their opportunity to show off the results of their labor. Lee Danisch won the prize for the best model of the Gear, which with the Hammer and Tongs is symbolic of Theta Tau. The new initiates also teamed up to present a skit. Let the pictures on the next page speak for themselves.

Fine fellows all,
They are now Theta Tau

Settled at last,
For a bon repast

Joke one was good, joke two was bad;
Father O'Brien, you're quite a lad

Hey, baby, want to have fun?
Swing those hips till the rising sun

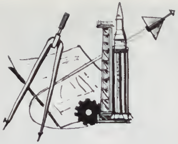
Here I stand, just lil ol' me,
Spitt'n image of Gypsy Rose Lee

One more snack before the show;
If I do it fast, they'll never know

Come hear my song I sing to you,
'Bout that party school, G.W.U.

Our skit is over, our poem, too;
It's time to go, to bid adieu

TECH NEWS



D-C TRANSFORMER

Working with extremely thin films of tin deposited on a glass slide, a General Electric physicist has built and operated a laboratory model of a direct current (D-C) transformer -- long considered an "unachievable" scientific goal.

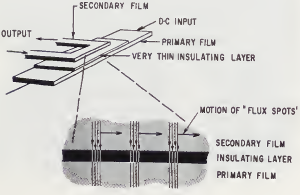
The device is a result of research on superconducting materials — metals and alloys that have zero electrical resistance and unique magnetic properties at very low temperatures. In a report at an American Physical Society meeting recently, Dr. Ivar Giaever disclosed that his D-C transformer -- which can convert a direct current input into a larger or smaller direct current output -- has been operated at very low voltages and currents, with an efficiency of about ten percent.

Although no immediate commercial applications are foreseen for the D-C transformer, the device marks the achievement of a goal that had eluded researchers ever since the alternating current transformer was first demonstrated nearly a century ago.

The conventional A-C transformer has long been a familiar sight on electrical power poles and inside radio and television sets. Such A-C transformers consist basically of two separate wire coils placed near one another. When an alternating current is passed through one coil (the primary), a changing magnetic field is produced — one in which the magnetic lines of force travel first in one direction and then in the opposite direction. This changing field induces an alternating current in the second coil (the secondary).

These conventional A-C transformers are unable to transform direct current -- which, in materials with conventional magnetic properties, sets up an unchanging magnetic field.

In the new D-C transformer, the primary and the secondary are made of thin tin films, which belong to a family of Type II superconductors. When an ordinary superconductor is placed in a magnetic field, the metal excludes the magnetic lines of force. Type II superconductors, on the other hand, can be penetrated by a magnetic field -- but only in so-called "flux spots."



When a direct current is passed through the tin primary, the magnetic flux spots begin to move in one direction relative to the film. In the D-C transformer, these flux spots also penetrate and move through the adjacent secondary film. As a result of this moving (and hence changing) magnetic field, a direct current is induced in the secondary film.

The magnetic field fluctuations produced by the primary of the D-C transformer exist only very close to the film. Thus, the secondary film must be placed no more than about .000001 inch away from the primary film. In Dr. Giaever's experimental devices, the primary and secondary films -- each only approximately 1000 angstroms thick -- are separated by an even thinner film of silicon oxide, an insulating material, only about 100 angstroms thick.

By placing a number of secondary films in series in the D-C transformer, it is possible to develop a secondary voltage many times higher than the primary voltage. Similarly, by placing a number of primary films in series, the output voltage can be "stepped down" below the input voltage.

The D-C transformer marks Dr. Giaever's second major contribution to superconductor research. In 1960, he announced the discovery that electron "tunneling," originally observed only in carefully prepared semiconductor materials, also could occur in thin film superconducting devices of far simpler configuration. Subsequent tunneling studies have added greatly to fundamental scientific knowledge of both tunneling and superconductivity.

A laboratory model of the direct current transformer — long considered an "unachievable" scientific goal — is held by Dr. Ivar Giaever. When placed in the container in front of Dr. Giaever and cooled to liquid helium temperatures (454 degrees Fahrenheit below zero), the unique device can convert a direct current input into a larger or smaller direct current output.

For this earlier work, Dr. Giaever — who is a physicist in the General Physics Laboratory at the G.E. Research and Development Center, Schenectady, New York — was awarded the 1965 Oliver E. Buckley Solid State Physics Prize of The American Physical Society.

OPTICAL RENDEZVOUS SYSTEM DEVELOPED FOR LUNAR EXCURSION MODULE

AC Electronics Division of General Motors is NASA's prime contractor for building and integrating the navigation and guidance system for both the Apollo Command Module and Lunar Excursion Module (LEM). The Command Module will carry three astronauts and place them in a lunar orbit; the LEM will take two of them to the moon's surface and back to a rendezvous with the orbiting Command Module. The responsibility for developing the rendezvous system is an extension of AC's management function.

The Lunar Excursion Module Optical Rendezvous System (LORS) will consist of a high-intensity beacon mounted on the Command Module and an optical tracker mounted on the LEM. The optical tracker is designed to track stars for reference data to the guidance and navigation inertial platform, and to track the high-intensity

beacon on the Command Module. As the Command Module orbits the moon, the beacon flashes. The special characteristics of the tracker will enable it to discriminate between the beacon and stars. When the tracker has located the Command Module beacon, necessary information is fed automatically into the LEM guidance computer which calculates the rendezvous flight plan.

"HARDIMAN": MUSCLE SUIT FOR THE ARMY

A contract has been awarded the General Electric Company for development and construction of a set of "mechanical muscles" that will give an ordinary man the strength of a giant.

By means of an advanced system of levers, control linkages, and servomechanisms, this unique machine will mimic and amplify the movements of its operator — dramatically extending his strength and endurance. This man-machine marriage will essentially combine the operator's dexterity, brain-power, and all-round versatility with a machine's strength, size, and ruggedness.

A research prototype of the "mechanical muscles" machine is now being developed at the General Electric Research and Development Center in Schenectady, New York.

Worn like an external skeleton, the "mechanical muscles" machine — nicknamed HardiMan — will permit its operator to lift a 1500-pound load while exerting only a fraction of this force. He will be able to perform general load-handling tasks, including walking, lifting, climbing, pushing, and pulling. The machine — technically described as a "powered exoskeleton" by its developers -- will be attached to the operator at the feet, forearms, and waist.

Potential applications for the HardiMan are foreseen in warehouse and factory operations, bomb loading, and underwater salvage. Although the prototype will be connected to a separate power supply by means of flexible hydraulic lines, it is anticipated that later models will have self-contained power units.

The HardiMan project is funded under a program jointly supported by the U. S. Army Natick (Massachusetts) Laboratory and the U. S. Office of Naval Research.

The contract announced resulted from 15 years of work on cybernetic anthropomorphous machines (CAMS) at the General Electric Research and Development Center. The engineering technology for "force feedback" control — the key to HardiMan — was developed by Ralph S. Mosher, who will guide development of the machine.

Force feedback means that proportions of the forces generated or encountered by the machine are duplicated and reflected to the operator. If the machine's arm or leg strikes a solid object, the operator feels that identical force situation of striking a solid object with his arm or leg.

As a result, the machine simply becomes an extension of the man, and the operator is able to concern himself solely with performing the task at hand. Thus, man now has the ability to control a multi-motion machine in a natural way and to move loads at higher speed, with greater dexterity, than ever before. The control concept makes training time almost non-existent.

—Continued on next page

The effectiveness of a man-machine marriage was first demonstrated by General Electric engineers with the construction of a remote-controlled manipulator with two claw-like hands. Forces encountered by the "slave" hands were fed back to the operator, enabling him to "feel" what he was doing. As a result, he could handle dangerous substances -- such as radioactive materials -- from a safe distance.

The HardiMan machine will be controlled by hydromechanical servovalves — the mainstays of the force feedback system. The research prototype machine is scheduled for delivery in early 1968.

MOBILE PREFABRICATED PIERS FOR VIET NAM

The enormous logistics bottleneck created in Viet Nam by the combination of a rapid military buildup and the lack of adequate port facilities hopefully will be uncorked in the next few months.

De Long Corporation of New York, a general marine engineering and contracting company, will install prefabricated piers with a total working area of nearly 350,000 square feet at various locations along the coast of South Viet Nam.

By next fall, a total of 23 De Long pier units -- 10 of them 300 feet long and 80 feet wide -- are expected to be in use to provide deep-draft berthing for cargo vessels. The 23 units will be assembled into seven complete piers to be installed at as many locations.

Several hundred rubber and steel shock absorbers, each weighing 185 pounds, will be provided by Goodyear's Industrial Products Division to equalize loads bearing on the caissons that support the piers.

The shock absorbers are made with four-inch-thick slabs of synthetic rubber sandwiched between two 1/4-inch steel plates. Each plate measures 32 inches by 22 inches — an inch wider and longer than the 85-pound slab of rubber that is bonded to the steel by vulcanization.

Each shock absorber has been designed to deflect 40 per cent (1.6 inches) under 1,000 psi loading and absorb 500,000 inch-pounds of energy.

Mobile prefabricated piers have several advantages over conventional structures. They can be built in shipyards where manpower, materials and equipment are readily available, towed to distant sites and installed in a fraction of the time required to construct conventional piers.

Installation is on a semi-permanent basis, as will be done in Viet Nam, but mobility can be restored easily and the piers moved quickly from place to place as conditions change.

The 23 De Long pier units were ordered by the Army last December, and will be assembled in a Japanese shipyard. Installation in Viet Nam will begin in a few weeks, and the project is scheduled for completion later this year. Several years would be needed to construct conventional piers of similar size.

Thus the De Long piers are expected to provide a quick solution to the problem of ships standing by as long as two months waiting to discharge military supplies at Vietnamese ports with inadequate unloading facilities.

Caissons six feet in diameter are driven into the bottom of a harbor to support a De Long pier. Huge air jacks with rubber gripping devices grasp the caissons and raise or lower the barge-like units to the desired level.

In the semi-permanent installations to be made in Viet Nam, four brackets will be welded to each caisson to support the platform. Then the air jacks and sections of the caissons extending above the pier will be removed.

The brackets will then support the deck, with the steel and rubber "sandwiches" absorbing and equalizing the load bearing on each caisson.

A De Long pier built several years ago already has been installed at Cam Ranh Bay, halfway up the coastline of South Viet Nam. It was towed from Charleston, S. C., and placed in operation six weeks after it arrived last fall.

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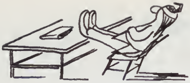

H A H!

by Judy Popowsky

Read the joke page yet? No? Well, I'll wait. ..... dum de dum ... de de .... oh, you're back. Good. Now we can begin. Sit back, relax, make yourself at home, have a little beer maybe .... and listen. I'm going to talk ... about jokes.

Ever wonder why a joke is so funny? Ever stare unbelievingly at the oddball over there who doesn't even crack a smile when everyone else in the room is in tears from laughing so hard? Ever stop to think that you have probably never failed to hear laughter or see someone smiling ... no matter WHERE you were; yet, there were places where the women don't cry, or only certain types of food can be eaten, or other such strange phenomena take place?

Welcome to a small group of wonderers! Not too many people have directed serious efforts toward finding out what makes humor tick. And those that have, can't seem to come to any kind of general theory that would cover everything. Take, for instance, Freud's views. According to Mr. F., humor leans on the presence of anxiety which is caused by tension, which is produced by emotions surrounding sex and/or aggression tendencies. By momentarily gratifying some impulse or wish which is terribly dangerous or forbidden, and by reducing the anxiety which normally inhibits fulfillment of these wishes, humor gives pleasure.

Carrying this anxiety idea further, we turn to Mr. Levine, who has made valiant attempts to interpret reactions to certain humorous situations as indications of a person's mental balance (or imbalance). He proposes three basic reactions, and their indications:

(1) The joke produces or awakens no anxiety. The person feels no need to laugh, and he does not.

(2) The joke does produce anxiety, and the person is able to dispel this at once, i.e., the person feels the need to laugh, and does so.

(3) The joke produces too much anxiety, and the person is unable to dispel it. This means that the person feels the need to laugh, or to do something to release the tension, but cannot.

Now, both of these theories are O.K., as far as they go. But we still don't have a concrete idea of WHAT humor is. And we won't, because no one really knows. It's like asking, "Why is there air?"

The most anyone has been able to come up with is fifteen elements of humor, which I will enumerate (and elaborate upon, when I feel it is necessary) below. When you read them, keep a picture in the back of your mind of people you know, telling jokes and laughing. Then, see if you agree.

A. Humor is a cultural universal. It exists everywhere.

B. Where religion can be made as important as people wish to make it, humor and wit ARE important, extremely important.

C. Humor is pretty much the same everywhere. This is so because the basic drive for humor can only be satisfied by a terribly restricted range of reactions. Other basic drives, such as food and shelter, can be satisfied in any number of ways.

D. Humor does not occur in isolation. More than one person has to be involved, even remotely, in order for something to appear funny.

E. Going further with this last idea, the people involved must share some sort of bond with one another in order to see the humor in a situation. The bond may be as loose as just having been passengers on the same bus when something funny happened, but the bond must be there. This complicity in humor is called, by one notable personage, the "secret free-masonry" of humor.

F. Reaction to a funny situation leaves us emotionally defenseless, even if only for a brief moment. We laugh because we can't really help ourselves.

G. Accordingly, humor begets humor. Once you have started laughing at one joke, it is considerably easier to laugh at another joke, which may or may not be worthy of so great a response. This is what a good comedian plays on.

H. He would also play on the idea that laughter is contagious, just like yawning. The power of suggestion here is stupendous!

I. The reaction to humor, or the capacity to respond, is a measure of mental health.

J. On the one hand, humor can be very gratifying.

K. On the other hand, a guy becomes slightly bothered if he has failed to see the humor in a joke, especially when it is obvious that everyone else has.

L. The degree of humor seen in a situation is directly proportional to the distance, in time or space, between the situation and the person. Many events which seemed dramatic at the time they occurred may now seem almost ludicrous. And, if a man bites a dog in Keokuk, Iowa, I'm sure it's rather serious to both of them ...... but, well, pardon me. I'd laugh at just the prospect.

M. Explanation is the main cause of death to all jokedom. A word of caution: don't try to explain why a joke is funny. After awhile, you won't be laughing either.

N. The comic does not exist outside the pale of what is strictly human. If you've ever laughed at a rock formation, it was probably because "it looked like George!"

O. And, finally, the number of people who have seriously studied humor ... is very, very small.

With that, I end this meager flight
Into the realm of pure delight
Which, ruled by Laughter and King Wit,
Still proves too vast for man to fit
Into his tiny book of bugs
To look at.

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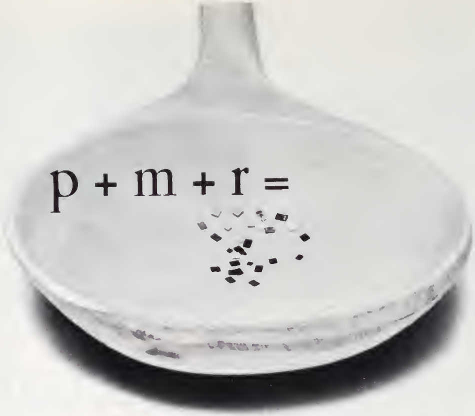

Ten years ago we were making only a handful of relatively simple semiconductor devices for a limited number of applications. Today, with highly advanced and exotic processes, we are producing hundreds of different and sophisticated semiconductors — for thousands of applications. Our technicians can now control material composition down to the molecules with precise regulation of impurity levels — and on a daily production line basis.

This we call PERFORMANCE.

Five years ago we produced semiconductor packages the size of a pencil eraser that replaced the big glass vacuum tubes in your radio. Today we're making sophisticated semiconductors that perform giant-sized tasks — yet fit on a soupspoon like grains of rice.

We call this MINIATURIZATION.

Drop the old time vacuum tube and it would smash. Its parts wore out pretty regularly too. Shake it or shock it beyond relatively modest limits and you were in trouble. Now you can launch a space vehicle with thousands of semiconductor components to go all the way to the moon and back . . . and make it go back around all over again. And a couple of times more after that.

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Shake 'em, shock 'em, squeeze 'em or freeze 'em — today's electronic devices have got to be able to take it . . . and perform. Motorola makes them as though they're a matter of life or death.

Sometimes they are.

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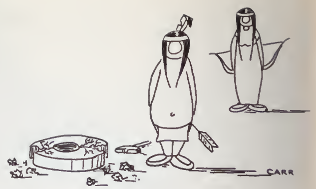
THE SHAFT



Three men and a woman were shipwrecked on a desert island. After two weeks the woman was so ashamed of what she was doing she killed herself ... Two weeks later, the men were so ashamed of what they were doing, they buried her ... A week later, the men were so ashamed of what they were doing, they dug her up again.

* * *

There's this new fly spray made of spirits of Amarousa and Spanish Fly. It won't kill flies, but you can swat two every time.

* * *

Angry widow (after learning husband has left her nothing): "I want you to take 'Rest in Peace' off that tombstone I ordered yesterday."

Engraver: "I can't do that, but I can add something else."

Widow: "All right. Add 'Till we meet again'."

* * *

The doctor had just completed his examination of the teenage girl:

"Madam," he said to her mother, "I'm afraid you daughter has syphilis."

"Oh, dear," exclaimed the embarrassed mother. "Tell me, Doctor, could she have possibly caught it in a public lavatory?"

"It's possible," replied the physician after a moment's reflection, "but it would certainly be uncomfortable."

* * *

A certain brewer sent a sample of his beer to a chemist to be analyzed. A few days later he received the reply: "Dear Sir, your horse has diabetes."

* * *

Engineer on the phone: "Doctor, come quick! My little boy has just swallowed my slide rule!"

Doctor: "I'll be right over. What are you doing in the meantime?"

Engineer: "Using log tables!"

Know what they call an abortion in Czechoslovakia?

A cancelled Czech.

* * *

Are you sure he was intoxicated?

No, sir, not positive, but his wife says he brought home a manhole cover and tried to play it on the Hi-Fi.

* * *

"Did you follow my advice about kissing your girl when she least expects it?" asked the sophisticated college senior of his younger fraternity brother.

"Oh, hell," said the fellow with the swollen eye, "I thought you said where."

* * *

A young couple recently moved into an Oakland apartment. Finding the place infested with mice, the husband purchased two mousetraps and placed them in the basement. One he put by a basket of apples and another by a box of nuts.

Late that night a loud "snap" was heard downstairs and the husband rushed to investigate. His wife followed him to the top of the stairs.

"I got him!" yelled the jubilant husband.

"Did you catch him by the apples, dear?" queried his wife.

"No, dear" he answered.

* * *

Looking coldly at the man who had just given him a nickel for carrying his bag twelve blocks, the little boy said, "You know, mister, I know something about you."

"What?" said the man.

"You're a bachelor."

"That's right. Do you know anything else about me?"

"So was your father."

* * *

And then there was the Indian who was so fond of iced tea that he drank twenty gallons. The next day they found him dead in his teepee.

Q: What do you get if you throw a canary in an electric fan?

A: Shredded tweet.

* * *

A small kid, running out of a burlesque show was grabbed by a doorman who asked him what was the matter. The kid said, "My Mama told me if I ever looked at anything bad I'd turn to stone ... and I can feel it starting!"

* * *

"I haven't had a bite for days," said a tramp to the landlady of an inn, the George and Dragon. "Do you think that you could spare me one?"

"Certainly not," replied the landlady.

"Thank you," said the tramp, and slouched off. A few minutes later he was back.

"Well, what do you want now?" asked the landlady.

"Could I have a few words with George now?" said the tramp.

* * *

Said the small boy, "I saw a flat dog along the highway ... it must have been flat ... another dog was trying to pump it up."

* * *

Then there was the country girl who, while milking a cow, saw a boy coming up the road. She called to her father, "Oh father, there is a boy coming up the road."

Her father promptly replied, "Go into the house."

She called back, "But father he is a college man."

"Then take the cow with you," he replied.

* * *

A tourist was being guided through the swamps of Florida.

He asked his guide, "I've heard that an alligator won't bite you at night if you are carrying a flashlight. Is this true?"

"That depends," replied his guide, "on how fast you can carry your flashlight."

Should man aspire to a nobler role?

The business press reports that many outstanding members of the Class of '66 have balked at entering industry.

Are we then to lie down and die for lack of smart new talent? No, thank you. We shall succeed in attracting high-ranking people from the Class of 1967 as we did from its predecessors on the country's campuses. We have no fear.

High-rankers are those who have demonstrated good grasp of the subject matter that scholars have gathered for them. The gathering must continue. Professors have an obligation to hang on to good gatherers. They are discharging it well. We too have an obligation. Ours is to lure high-rankers with their well grasped subject matter out into the world to put it to use. "Use" means tying it to the needs and desires of all kinds of people, everywhere. Which is what, at this particular stage in history in this particular land, business is all about.

Enough members of the Class of '67 will grasp that principle along with all the other principles they have grasped.

They will therefore seize the opportunity to take over the mighty machinery built by charter-writers with 19th century minds and convert it to late-20th century needs. **Who else is there to put in charge?**

Those who feel motivation in that direction and want to taste the realities without, before, or during pursuit of advanced degrees will find Kodak a sound choice among the blue chips.

We do indeed fill genuine needs—teaching, recording facts, improving the effectiveness and efficiency of health services, putting better clothes on more backs and better food on more tables, and all the rest of the long, long chain of technological consequences from our well known original and still flourishing involvement with Sunday afternoon snapshooting.

Let's get together and talk over the more personal details.

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